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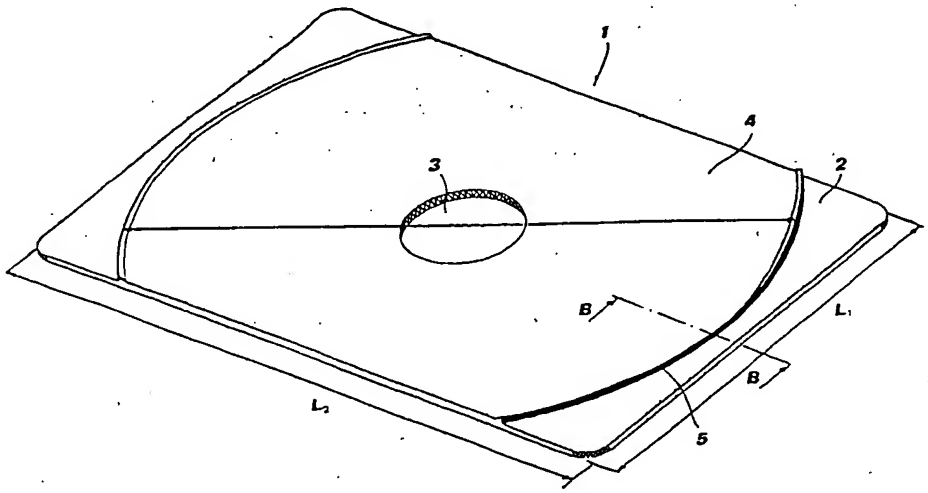

(57) Abstract

Improved optical support (1) for data storage, of the type having a non–circular profile, or a circular profile with a non–standard diameter, apt to be used, through a hole (3) formed into the support, in reading and/or writing devices of CD or DVD disks, the housings of which are provided with at least two circular seats for disks of standard dimensions. According to the invention, the support (1) comprises a central portion, the perimeter of which is inscribable into the one of said circular seats having a smaller diameter, and a peripheral portion, the perimeter of which corresponds to said non–circular profile or to said circular profile with a non–standard diameter, said peripheral portion being steadily associated to said central portion and being less thick than the same, so that said central portion is apt to project from said peripheral portion in correspondence of the side of the support (1) resting onto said housings. The invention also concerns an improved process for the production of said optical support (1).

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"IMPROVED OPTICAL SUPPORT FOR DATA STORAGE AND PROCESS FOR THE PRODUCTION THEREOF"

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FIELD OF THE INVENTION

The present invention concerns an improved optical support for data storage and, in particular, a support having a profile which differs from the conventional circular profile. The invention also concerns a preferred process to produce said optical support.

More specifically, the invention concerns an optical support having a substantially rectangular profile, equipped with devices apt to allow a fast and reliable centering thereof in a reader for conventional circular-type optical supports, and also provided with means to protect the reading side.

STATE OF PRIOR ART AND RELATED PROBLEMS

As known, the use of optical supports for data storage is widely spread. In particular, Compact Disks (CD) in the Read-Only-Memory (CD-ROM), Writable (CD-R) or Re-Writable (CD-RW) formats, are widely used in industries for musical, video and photographic productions, as well as in informatics. A new typology of "CD" is moreover spreading, characterized by a data storage capacity considerably higher than the present one, namely the so-called Digital Versatile Disks (DVD) wherein the optically active surface, besides containing a far larger quantity of data - up to about 5 Gb - can be extended to several superposed layers. Also the DVD are present on the market not only in the Read-Only-Memory format, but also in the formats already cited for Compact Disks, namely the Writable (DVD-R) and Re-Writable (DVD-RW) formats, as well as in a Random Access Memory (RAM) format. For convenience, reference will be made hereinafter only to "CD", meaning to include therein all the types of disks listed heretofore.

The conventional circular CD with an axial hole are read and/or written by specific devices equipped with mechanisms, apt to cause the rotation of the CD by interacting with the axial hole thereof, as well as with optical means. The housings of such devices, into which are fitted the CD, are circular and of dimensions equal to those of the CD meant to be housed

therein. In particular, at least two concentric seats are provided at present into such housings, said seats corresponding to the standard dimensions of the two CD typologies now on the market, having a diameter of 80 mm and 120 mm respectively.

Recently, optical supports for data storage having a profile other than the circular profile have been conceived and spread on the market, such supports being however still provided with a hole to interact with the rotation mechanisms of the common reading and/or writing devices. The profiles of such optical supports can be either irregular, for aesthetic purposes, or regular, for instance rectangular. Said supports with a non-circular profile, usually smaller than the conventional CD, can be more easily carried around as they take up less space, and they can be suitably used for a fast and frequent search of information, as for example in the case of electronic visiting cards. In fact, even if said supports are not circular, the data to be stored is inserted into a circular area concentric to the hole provided in the support and inscribed in the actual support; it is thereby possible to record onto a very small support - easy to handle and comfortably fitted into the document holders already present on the market - a very considerable amount of data.

Nonetheless, the supports with a non-circular profile have a serious drawback when being fitted into the appropriate housings of the optical reading and/or writing devices. In fact, since the seats of the housings for the optical supports are circular, it is not easy - to start with - to position said supports in a manner such as to cause their hole to exactly correspond to the pin of the rotation mechanisms, and - secondly - while the housing performs its closing movement, the supports can easily move out of position. When the hole of the supports is not properly aligned with the rotation mechanisms, besides making it impossible to carry out the reading and/or writing, it can can cause damages to the support, or the latter may in turn damage the reading and/or writing device. Said drawback obviously also occurs in the case of circular supports having a non-standard diameter,

To overcome such a drawback it has been proposed, in technique, to form the outer profile of the support in a manner such as to comprise at least

three points tangent to one of the two circular seats provided in the housing, This is however apt to considerably condition both the design of the profile of said supports and their dimensions; in particular, in the case of supports having a rectangular profile, this system does not allow to obtain supports having the size of a normal visiting card, and thus apt to be used as an alternative thereto.

Another solution, recently proposed in the Patent WO-99/00765, provides to form in the lower part of the support - in correspondence of a circumference concentric to the hole and the size of which is equal to that of the smaller seat of the housings for the disks - one or more reliefs in the form of tips or arched lines, by means of a punching process carried out on the support. Said solution does not however reach the intended object and, furthermore, it involves other considerable drawbacks. In fact, to start with, the maximum height of the reliefs apt to be obtained with a punching process is too low to guarantee an easy and reliable centering of the support; on the other hand, the height of such reliefs is limited by the fact that the overall thickness of the support must be kept within a very definite and restricted range in order to comply with the specifications of the reading and/or writing devices; moreover, the punching process makes the support very fragile in correspondence of the punching areas, thereby determining cracks and flaws which then shortly lead to breakage of the support.

A first object of the present invention is to hence allow obtaining, in a simple and reliable manner, a perfect positioning of the optical supports for data storage, having a non-standard shape, into the standard circular seats of the optical reading and/or writing devices existing on the market, without giving rise to any of the drawbacks cited heretofore in respect of the known type supports and thus, in particular, without creating any serious conditioning problems in designing the profile of the support and without determining any damages in the physical characteristics of said supports.

Considering now a further aspect of the present invention, it has to be noted that all the optical supports for data storage - and especially those having a non-conventional profile - when subject to a frequent and fast use, involve considerable problems of wear of the disk reading side, caused by the

constant handling of the disk, which determine the presence of scratches and corrosions up to making the support no longer readable and/or writable. Such problems become particularly serious due to a frequent use of the support and to the lack of appropriate cases to contain and preserve the same; these two circumstances are typical of the supports having a non-circular profile since, on account of their small dimensions, the user is inclined to keep them - rather than in suitable containers - into improper seats, such as clothing pockets or wallets, thereby placing them in contact with objects which may scratch them or scrape them off.

A second object of the present invention is to therefore supply - in a simple, economic and reliable manner - an optical support for data storage, efficiently protected against wear on the readable and/or writable side.

As mentioned at the beginning, the present invention also concerns an improved process to produce optical supports having a non-circular profile. In fact, the known processes to produce the conventional circular optical supports include the following working steps:

- injection molding of the disk of plastic material (for instance polycarbonate);
- in the case of CD-R or DVD-R, application of a dye layer, with removal of the dye in excess around the disk edge;
- in the case of CD-RW, DVD-RW or DVD-RAM, application of a layer formed of several combined metals;
- application of a reflecting metallic layer;
- application of a layer of protective lacquer;
- label printing.

All the aforespecified layers are applied only on one side of the disk, and precisely the non-readable side, while the opposite side - namely, the readable side - undergoes no treatment. The application of the dye and of the protective lacquer can indifferently be carried out with a spin-coating process - in which the product is applied in liquid form at the centre of the disk, while said disk is caused to rotate at high speed so that the spreading of the product over its entire surface is obtained by centrifugal force - or with a more costly silk-screen process. The application of the metallic layers is instead obtained with a

sputtering process, in which a cathode formed by the coating material is pulverized under vacuum and under the action of an electric field, to cover the anode consisting of the surface of the disk meant to be coated.

For the production of optical supports having a non-circular profile, the technologies adopted up-to-date have been of the substantially mechanical type, namely providing for the conventional production of an optical support of standard circular shape, followed by a mechanical machining thereof, normally by punching, to obtain the desired non-circular shape. This technology is however fully unsatisfactory for several reasons. To start with, it involves a waste of the material resulting from the punching process; secondly, it requires a further machining of the punched support in order to trim its edges; and finally - a no doubt more serious drawback - it does not allow to obtain a product lasting in time, In fact, the punching process alters the distribution of the inner stresses of the molded product and thus easily determines the formation of cracks and flaws, with a consequent fast deterioration of the useful life of the support,

A third object of the present invention is to thus supply a process for the production of optical supports having a non-circular profile, which does not involve the aforementioned drawbacks and, in particular, does not involve waste of materials and does not require mechanical machinings to form the support.

SUMMARY OF THE INVENTION

According to the present invention, all the aforementioned objects are reached with an improved optical support for data storage - of the type having a non-circular profile, or a circular profile with a non-standard diameter, apt to be used, through a hole formed into the support, in reading and/or writing devices of CD or DVD disks, the housings of which are provided with at least two circular seats for disks of standard dimensions - characterized in that it comprises a central portion, the perimeter of which is inscribable into the one of said circular seats having a smaller diameter, and a peripheral portion, the perimeter of which corresponds to said non-circular profile or to said circular profile with a non-standard diameter, said peripheral portion being steadily

associated to said central portion and being less thick than the same, so that said central portion is apt to project from said peripheral portion in correspondence of the side of the support resting onto said housings.

Said optical support is obtained by means of a production process including the following working steps:

a) - injection molding of the optical support into a mold having one or more impressions, the shape of which is identical to that of the finished support;

b1) - in the case of CD-R or DVD-R, application of a dye layer, with removal of the dye in excess around the disk edge, on one side of the support;

b2) - in the case of CD-RW, DVD-RW or DVD-RAM, application of a layer formed of several metals;

c) - application of a reflecting metallic layer on the same side of the support;

d) - application of a layer of protective lacquer on the same side of the support;

d1) - possible application of a layer of protective lacquer on the other side of the support (reading side);

d2) - removal of a thin layer of the support in correspondence of the edge, by means of a laser erosion technique;

e) - label printing.

In said process, the steps b1), d) and d1), are carried out by means of a spin-coating process into a coating apparatus, whose rest plate for the optical support to be coated comprises at least one pair of deflection tabs fixed to the surface of the plate onto its portions not covered by the support.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the present invention will anyhow result more evident from the following detailed description of some preferred embodiments thereof, illustrated with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a first embodiment of the optical support according to the present invention;

Fig. 2 is a part section view of the support, on an enlarged scale, along the line A-A of fig. 1;

Fig. 3 is a perspective view of a second embodiment of the optical support according to the present invention;

Fig. 4 is a part section view of the support, on an enlarged scale, along the line B-B of fig. 3;

Fig. 5 is an exploded perspective view of a third embodiment of the optical support according to the present invention;

Fig. 6 is a part section view of the support, on an enlarged scale, along the line C-C of fig. 5;

Fig. 7 is a diagrammatic perspective view of a device to apply a dye layer or a layer of protective lacquer on the optical support according to the present invention, by means of a spin-coating process; and

Fig. 8 is a section view, on an enlarged scale, along the line D-D of fig. 7.

DESCRIPTION OF SOME PREFERRED EMBODIMENTS OF THE INVENTION

With reference to fig. 1 it can be seen that, in this first embodiment of the optical support according to the present invention, the support 1 comprises a substantially rectangular base 2, with a minor side L_1 and a major side L_2, and an axial through hole 3. Preferably, the rectangular base 2 has beveled edges.

The optically active surface 4 of the support 1 is formed in relief in respect of the rectangular base 2 and it is shaped as a segment of a circle with two bases of height equal to L_1, symmetric in respect of the hole 3 and having a diameter D equal to the diameter of one of the circular seats provided into the reading and/or writing devices, normally the smaller seat having a diameter of 80 mm. The major side L_2 of the rectangular base 2 is thus wider than the diameter D of the surface 4.

In other words, as shown in the part section view of fig. 2, the central portion of the support 1 has a thickness S_1 which is greater than the thickness S_2 of its peripheral portion. The thickness S_2 may vary between 0,500 and 1,000 mm, and is preferably equal to 0,850 mm; while the thickness S_1 may vary between 1,100 and 1,300 mm, and is preferaby equal to 1,200 mm.

In the embodiment illustrated in figs. 1 and 2, the step 5 formed between the surface 4 in relief and the rectangular base 2, has right angles.

Thanks to the aforedescribed structure, the support 1 according to the present invention is apt to be easily inserted into the housings of the reading and/or writing devices. In fact, thanks to the right angles of the step 5 and to the appropriate dimensioning of the diameter D, the surface 4 (shaped as a segment of a circle) can be easily and steadily positioned into one (the smallest one) of the circular seats provided in the housings of the reading and/or writing devices.

To improve even further the capabilities of an easy and steady positioning of the optical support into said housings, in the second and preferred embodiment of said support - illustrated in figs. 3 and 4 - the two opposite circular rims of the surface 4 are provided with ribs 6 having a section shaped as a right-angled triangle - as clearly shown in fig. 4 - so that one of the sides of said rib is perfectly aligned with the aforecited step 5. This solution thus allows the step 5 to reach an overall height which is far more considerable than in the first embodiment of the support, thereby allowing to obtain a much faster and steadier anchorage onto the circular seat provided into the housings of the reading and/or writing devices. In particular, the thickness of the rib 6 is preferably about 0,300 mm, whereby the step 5 - which, in the first embodiment of the support, was preferably 0,350 mm high - now reaches an almost double overall preferred height, namely corresponding to 0,750 mm. The rib 6 can be formed onto the surface 4 by any known system, for example it can be applied by glueing, or it can be formed by injection molding in one piece with the surface 4, this last production system being the one preferred.

It should be noted that the preferred thickness of the rib 6 exactly corresponds to the thickness of the so-called stacker ring - namely the circular rib provided in all the CD close to their central hole (not shown on the drawings for simplicity) - which allows to stack the CD during production thereof, preventing their respective facing surfaces to get in full contact, which would create difficulties in the automatic handling thereof as well as

possible damages to the same. The fact that the rib 6 and the stacker ring have the same thickness allows first of all to to keep the overall thickness of the support within the specification ranges, and to thus easily cause the rotation of the optical support according to the present invention into the standard reading and/or writing devices, which are in fact already prearranged to receive CD of said thickness. It moreover allows to obtain an overall bearing surface of the CD - formed by the stacker ring and by the ribs 6 - which is totally flat and thus suited to preserve the reading surface of the CD when this latter is positioned onto a desk, a computer or any other flat surface.

In the third embodiment of the optical support according to the invention, illustrated in figs. 5 and 6, the base 2 of the support 1, having a substantially rectangular profile, is formed of a plastic material and comprises a depressed seat 7 having the same shape as a segment of a circle with two bases, already described for the surface 4 of the support 1 of the first and second embodiments, and being equally provided with an axial hole 3.

Into the depressed seat 7 there is fixedly connected, by glueing or other systems, an optically active layer 8 having exactly the same shape, as a segment of a circle, and also provided with an axial hole 9, so as to perfectly mate with the shape of the seat 7. Furthermore the step 10, formed in the base 2, and the corresponding rim 11 of the optically active layer 8 have both right angles, so that the final step formed by the coupling between said layer 8 and the base 2 is also at right angles and thereby allows to obtain a centering of the support 1 into the housings of the reading and/or writing devices, which is exactly like that obtained with the step 5 present in the first embodiment of the invention. The optically active layer 8 is formed by injection molding of a suitable plastic material, it can consist of a single layer or of more reciprocally glued layers, and it may of course perform any type of function according to the different types of CD or DVD; the overall thickness S_1 of said layer 8 varies between 0,950 and 1,150 mm, and is preferably equal to 1,050 mm. The base 2 can also be formed by injection molding of a suitable plastic material, or it can consist of another supporting material, as for example paper or cardboard; in this last case, said base 2 can be formed by pressing or die cutting. As

clearly shown in fig. 6, the peripheral portion of the base layer 2 has a thickness S_2 which is greater than the thickness S_3 of the depressed seat 7. The thickness S_2 may vary between 0,500 and 1,000 mm, and it is preferably equal to 0,850 mm; whereas, the thickness S_3 may vary between 0,100 and 0,300 mm, and it is preferably equal to 0,150 mm.

The optical support 1 of the third embodiment described heretofore can however also be realized with a modified shape, similar to that described for the second embodiment of the support according to the invention. In this case, a rib 6 (as shown in fig. 4) is formed onto the edge of the optically active layer 8 so that one side of said rib is aligned with the rim 11, thereby obtaining - also in this case - a final step which is much higher and thus allows a faster and more reliable centering action.

In all the aforedescribed embodiments of the optical support according to the present invention, it is moreover provided to protect the reading and/or writing side of the CD, namely the surface of the optically active layer 4 or 8, with a further coating layer consisting of a protective lacquer, meant to preserve from scratches and abrasions said side of the support. Preferably, said lacquer is an acrylic-based lacquer with UV polymerization and it is applied as a coating layer having a thickness between 3 and 10 μm.

The optical support according to the present invention is produced with an improved process which, starting from the standard steps of the process for producing the conventional CD, introduces some new steps which allow to make said process particularly effective for the production of optical supports having a non-circular profile; furthermore, it is fully exempt from the drawbacks cited heretofore in connection with the process adopted in known technique to produce such optical supports.

To start with, in the injection molding step, instead of adopting the circular mold of the conventional CD, use is made of a mold having one or more impressions exactly corresponding to the wanted final shape of the non-circular support. This allows to avoid any machining operation on the molded support and the drawbacks deriving therefrom.

The use of molds with non-circular impressions obviously creates problems of an even distribution of the flow of melted plastic material, which can however be equally obtained with an accurate design of the mold, of the channels feeding the melted material and of the air bleeding lines, as well as by a proper adjustment of the molding parameters. According to the present invention, the molding parameters are adjusted so that, in correspondence of each point of the molded support, the double refraction values of the reading surface of the support are below a limit value preset in the CD and DVD specifications supplied by Philips or Toshiba. In this way, it is hence possible to obtain optical supports having a non-circular profile, which are perfectly readable over the whole surface thereof and which can thus be used both with the conventional readers - apt to read on circular sectors positioned in sequence (that is, only into a circular concentric area inscribed in the support) - and with new types of readers, apt to read also on other areas of the support, as for example the orbital readers of the Patent Application WO-99/12159.

A second particularly innovative step - which has actually allowed to mold the optical support directly into the desired final shape, as described above - concerns the spin-coating process by which a dye layer, or a layer of protective lacquer, is applied onto the support. In fact, when adopting this coating technique - which allows to obtain better technical results and involves lower costs than the silk-screen process - it is indispensable to use rotary machines wherein the plates, onto which the support is rested and centered, are necessarily of circular shape. Since the optical support to be coated does not have such a shape, during the spin-coating operation some of the dye substance inevitably drops onto the rest plate and ends up by staining the edges and the lower part of the optical support; this requires subsequent cleaning operations on the support, which determine increases in the production costs. Moreover, the lack of radial symmetry of the optical support does not allow a uniform spreading of the coating substance.

According to the present invention, said problems are fully solved by carrying out the spin-coating process into an apparatus which has been modified as illustrated in fig. 7. As clearly shown, the rest plate 12, onto which

the optical support 1 is anchored by means of a suction cup 13, is provided with at least one pair of deflection tabs 14, fixed to the plate 12 in correspondence of a diameter thereof. The section of the tabs 14, shown in fig. 8, has a wedge-shaped configuration, with the inclined portion facing the direction of rotation of the plate 12. The tabs 14 are preferably fixed to the plate 12 in correspondence of the two long sides of the support 1 and, in any case, on opposite sides in respect of a diameter d of the plate 12, that is, slightly misaligned in respect of the center of said plate.

During rotation of the plate 12, the action of the tabs 14 positively influences the flow dynamics of the spin-coating process, in a manner such as to avoid any undesirable gathering of dye or lacquer in the areas not covered by the support 1, and thus obtain a perfectly uniform coating thereof. According to the dimensional characteristics and speed of the coating apparatus, it may be appropriate to change the number, positioning or section shape of the tabs 14, without thereby departing from the scope of the present invention.

A third innovative step finally concerns the cleaning operation carried out on the edge of the support to remove the layers deposited thereon. According to the present invention, said treatment is carried out with a laser erosion technique which allows to remove, in correspondence of the support edge, a very thin layer of the plastic material forming the support, and obviously also the layers deposited thereon.

The other steps of the production process require no particular modifications, except that, when applying the metallic coating layers with a sputtering process, it will be necessary to screen the areas of the support which are not meant to be coated - anyhow adopting a method which is fairly similar to that adopted for the conventional CD - so as to avoid, for example, covering with metal the central circular portion or the annular peripheral portion of the support.

In the preferred embodiments of the invention illustrated heretofore, the optical support 1 - or rather its base layer 2 - has a substantially rectangular profile and comprises a single optically active surface 4, or layer 8, shaped as

a segment of a circle with two bases, of height equal to the minor side of the rectangular profile and having a diameter equal to the diameter of one of the circular seats provided into the standard housings of reading and/or writing devices. Different embodiments can however be conceived, to provide supports having profiles and shapes of the optically active surface differing from the ones illustrated, in order to adapt them to the specific requirements of special applications, without thereby departing from the protection scope of the present invention such as defined in the following claims.

CLAIMS

1) Improved optical support (1) for data storage - of the type having a non-circular profile, or a circular profile with a non-standard diameter, apt to be used, through a hole (3) formed into the support (1), in reading and/or writing devices of CD or DVD disks, the housings of which are provided with at least two circular seats for disks of standard dimensions - characterized in that it comprises a central portion, the perimeter of which is inscribable into the one of said circular seats having a smaller diameter, and a peripheral portion, the perimeter of which corresponds to said non-circular profile or to said circular profile with a non-standard diameter, said peripheral portion being steadily associated to said central portion and being less thick than the same, so that said central portion is apt to project from said peripheral portion in correspondence of the side of the support (1) resting onto said housings.

2) Optical support as in claim 1), wherein said non-circular profile is a rectangular profile, and said central portion is shaped as a segment of a circle with two bases, of height equal to the minor side (L_1) of the rectangular profile and having a diameter (D) equal to the diameter of said circular seat of smaller diameter.

3) Optical support as in claim 2), wherein said central portion of the support (1) comprises an optically active surface (4, 8) of the CD-ROM, CD-R, CD-RW, DVD, DVD-R, DVD-RW or DVD-RAM type.

4) Optical support as in claim 3), wherein said central and peripheral portions are aligned in correspondence of one side of the support (1), while a right-angled step (5, 10-11) is formed between them on the other side of the support (1).

5) Optical support as in claim 4), wherein said central portion is formed in one piece, by injection molding, with said peripheral portion.

6) Optical support as in claim 5), wherein said central portion has a thickness (S_1) varying between 1,100 and 1,300 mm, and preferably of 1,200 mm, and said peripheral portion has a thickness (S_2) varying between 0,500 and 1,000 mm, and preferably of 0,850 mm.

7) Optical support as in claim 4), wherein said central portion comprises an optically active layer (8) fixedly connected to a base layer, and said base layer is formed in one piece, by injection molding, with said peripheral portion.

8) Optical support as in claim 7), wherein said central portion is formed by injection molding of a plastic material and comprises a single layer, or more reciprocally glued layers.

9) Optical support as in claim 7), wherein said base layer is formed by injection molding of a plastic material, or by pressing or die cutting of paper or cardboard.

10) Optical support as in claim 7), wherein said optically active layer (8) has a thickness (S_1) varying between 0,950 and 1,150 mm, and preferably of 1,050 mm; said base layer has a thickness (S_3) varying between 0,100 and 0,300 mm, and preferably of 0,150 mm; and said peripheral portion has a thickness (S_2) varying between 0,500 and 1,000 mm, and preferably of 0,850 mm.

11) Optical support as in any one of claims 4) to 10), wherein said central portion has a uniform thickness.

12) Optical support as in any one of claims 4) to 10), wherein said central portion comprises a rib (6) in correspondence of the step (5) formed between the same and the peripheral portion of the support (1).

13) Optical support as in claim 12), wherein said rib (6) has a section shaped as a right-angled triangle, one of its sides being aligned with said step (5).

14) Optical support as in claim 12), wherein the thickness of said rib (6) is of about 0,300 mm.

15) Optical support as in any one of claims 4) to 14), wherein the reading surface of said optically active central portion is coated with a protective lacquer.

16) Optical support as in claim 15), wherein said protective lacquer is an acrylic-based lacquer with UV polymerization.

17) Optical support as in claim 15), wherein the thickness of said coating of protective lacquer is between 3 and 10 μm.

18) Process for the production of an optical support as in any one of the previous claims, characterized in that it comprises the following working steps:

a) injection molding of the optical support (1) into a mold having one or more impressions, the shape of which is identical to that of the finished support (1);

b1) - in the case of CD-R or DVD-R, application of a dye layer, with removal of the dye in excess around the disk edge, on one side of the support (1);

b2) - in the case of CD-RW, DVD-RW or DVD-RAM, application of a layer formed of several metals;

c) - application of a reflecting metallic layer on the same side of the support (1);

d) - application of a layer of protective lacquer on the same side of the support (1);

e) - label printing.

19) Process as in claim 18), also comprising the following working step, before the step e):

d1) - application of a layer of protective lacquer on the other side of the support (1) (reading side).

20) Process as in claim 19), wherein said protective lacquer is an acrylic-based lacquer with UV polymerization.

21) Process as in claim 19), wherein said protective lacquer is applied in one layer having a thickness between 3 and 10 μm.

22) Process as in claim 18) or 19), comprising moreover the following working step, before the step e):

d2) - removal of a thin layer of the support (1) in correspondence of the edge, by means of a laser erosion technique.

23) Process as in claim 18) or 19), wherein the steps b1), d) and d1), are carried out by means of a spin-coating process into a coating apparatus, whose rest plate (12) for the optical support (1) to be coated comprises at least one pair of deflection tabs (14) fixed to the surface of the plate (12) onto its portions not covered by the support (1).

24) Process as in claim 23), wherein said tabs (14) have a wedge-shaped section, with the inclined portion facing the direction of rotation of the plate (12).

25) Process as in claim 24), wherein said tabs (14) are arranged in pairs, symmetrical about the centre of the plate (12) and slightly misaligned in respect thereof.

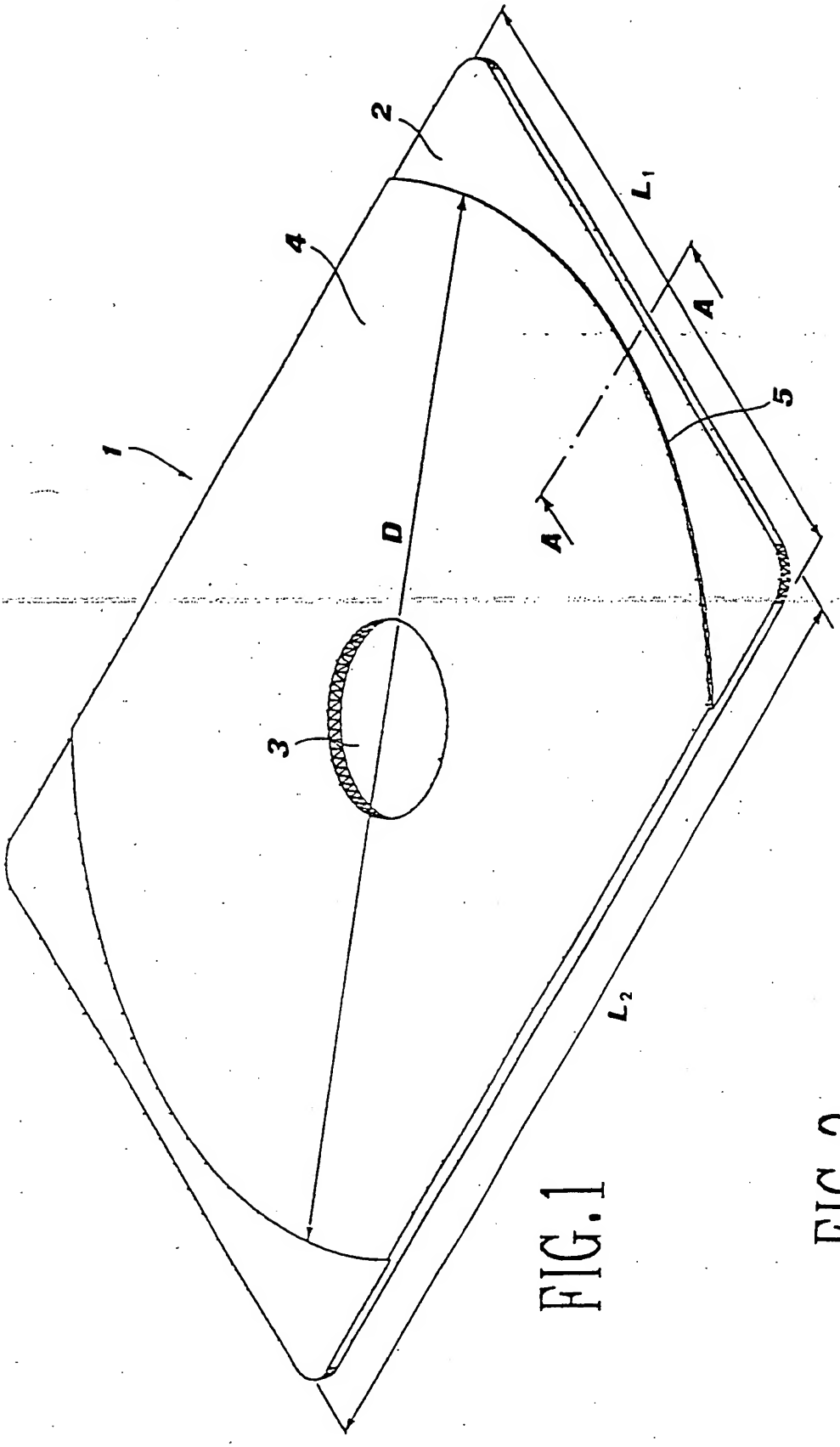


FIG.1

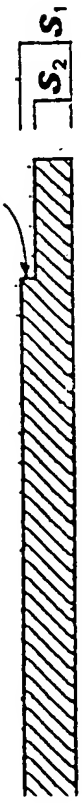


FIG.2

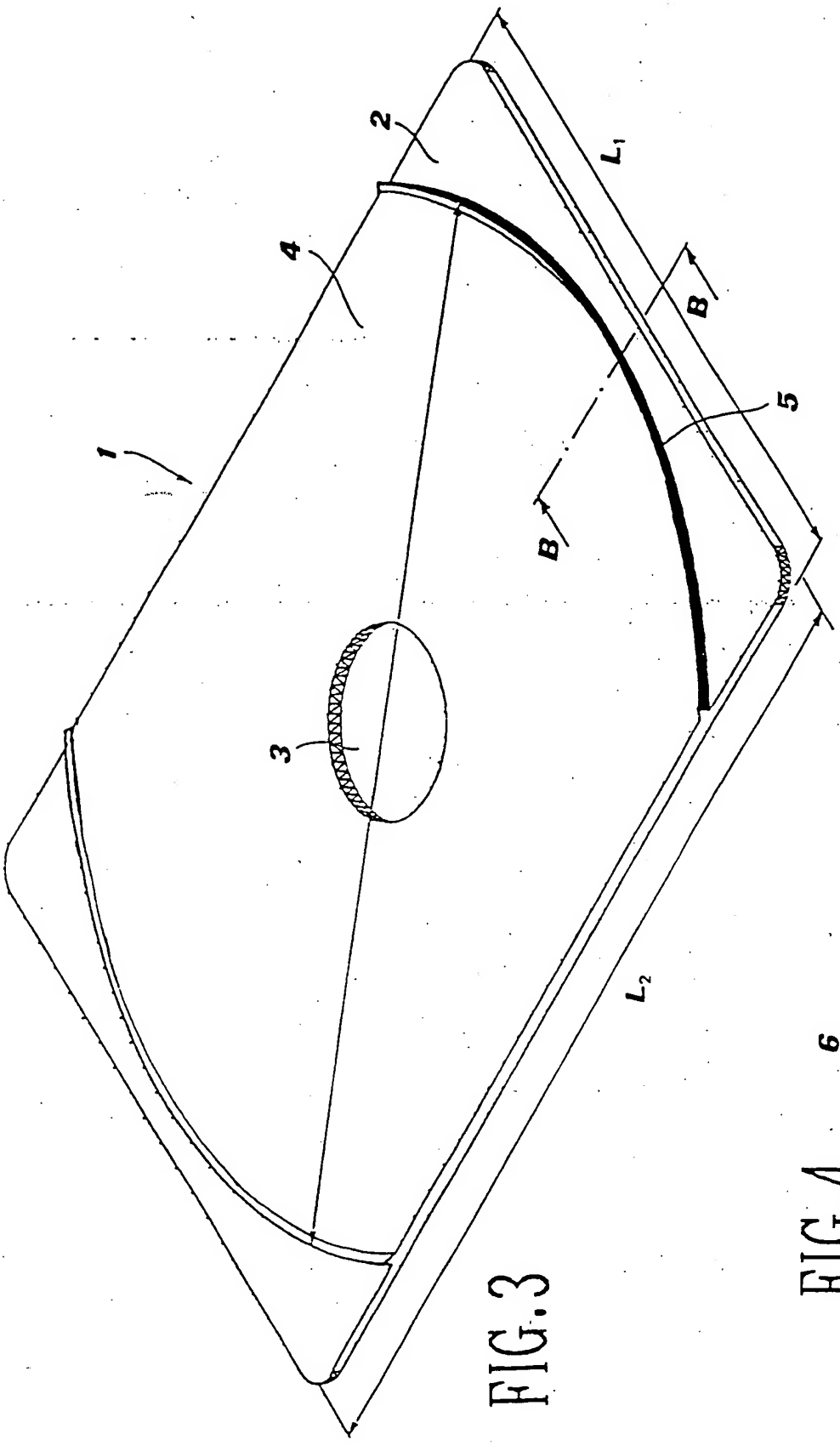


FIG.3

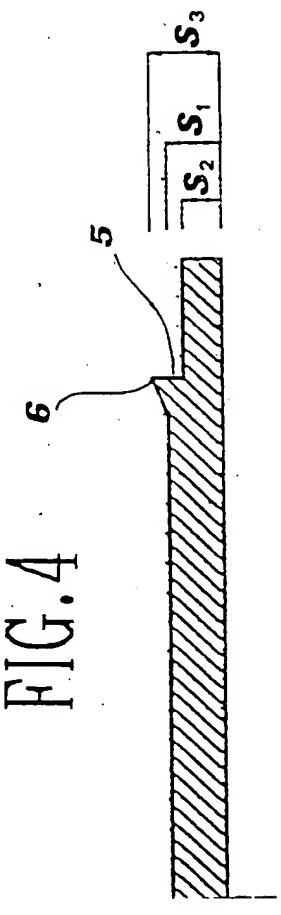


FIG.4

FIG.5

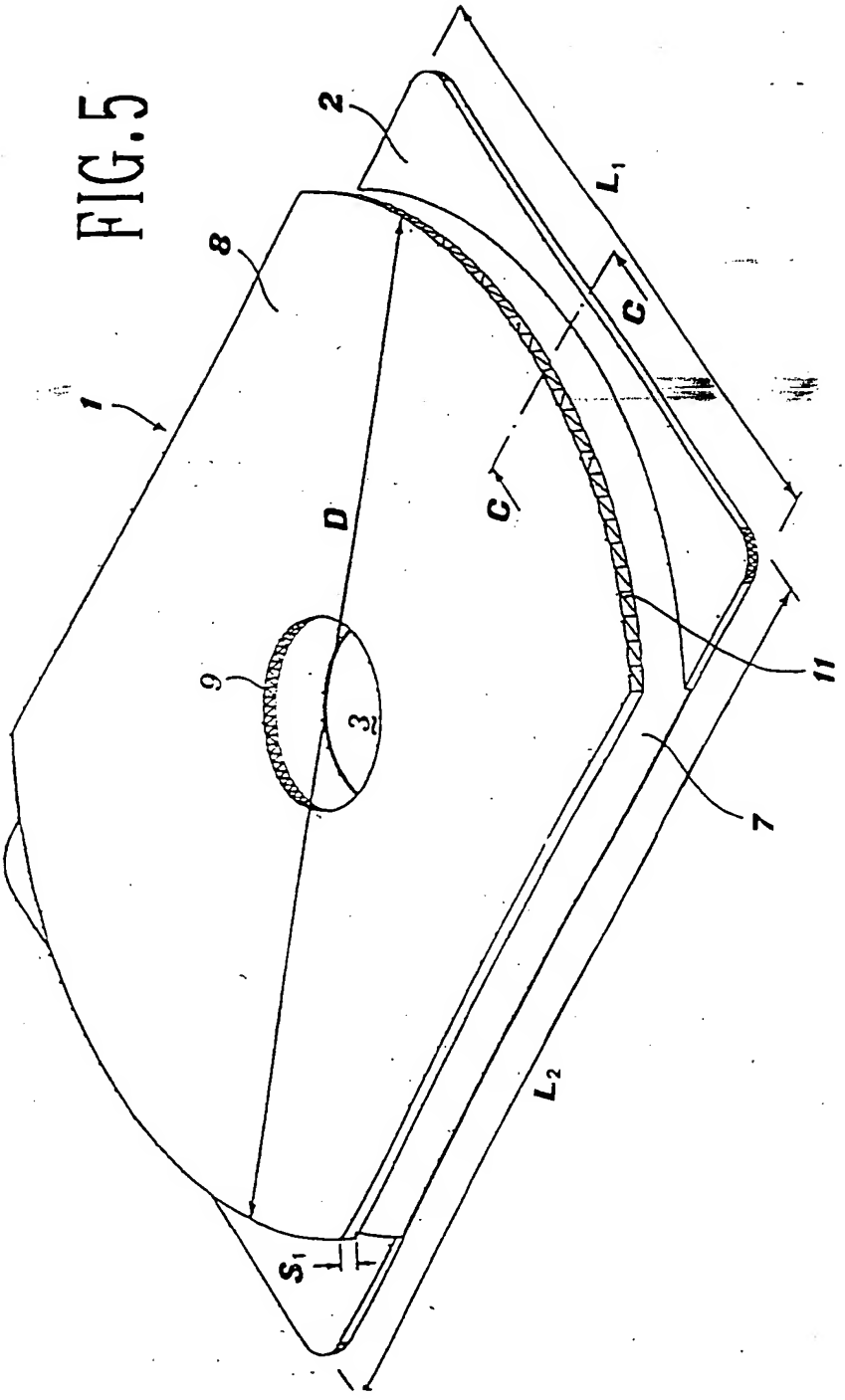
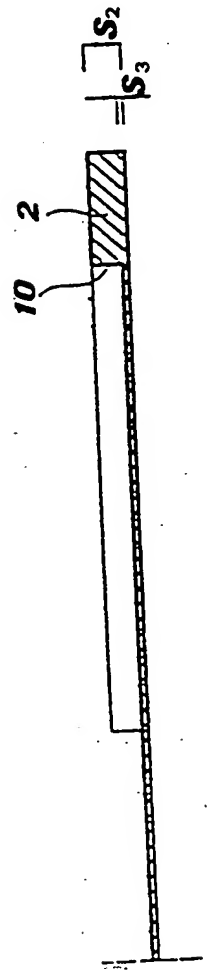


FIG.6



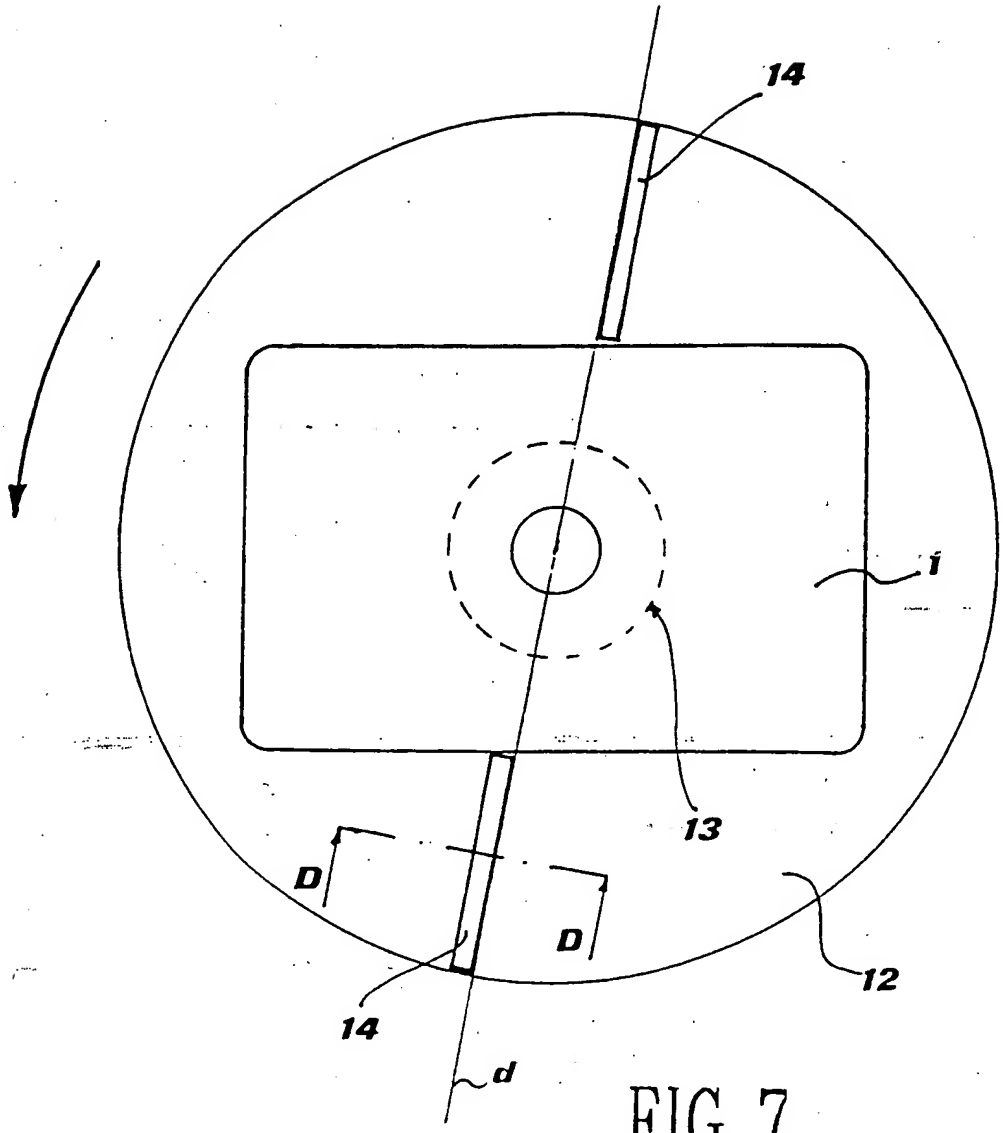


FIG.7

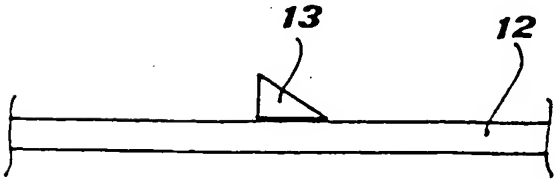


FIG.8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB 99/01642

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B7/24 G11B7/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	DE 298 20 749 U (ZIGGEL CARSTEN) 25 February 1999 (1999-02-25) the whole document	1-4,11
A	CH 688 996 A (FISCHER GERHARD) 15 July 1998 (1998-07-15) the whole document & WO 99 00765 A cited in the application	1-4,11
A	DE 297 08 978 U (BLAHA FRANTISEK ING) 10 July 1997 (1997-07-10) the whole document	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 January 2000	18/02/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax (+31–70) 340–3016	Annibal, P

INTERNATIONAL SEARCH REPORT

Int. tional Application No
PCT/IB 99/01642

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 628 956 A (TAIYO YUDEN KK) 14 December 1994 (1994-12-14) abstract page 5, line 4 - line 52 page 9, line 29 - line 32	18-21
A	DE 195 42 022 A (MINNESOTA MINING & MFG) 15 May 1996 (1996-05-15) page 1, line 3 - line 44 page 3, line 60 -page 4, line 34 page 9, line 6 - line 12	18-21

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Information on patent family members

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